
DEPARTMENT OF COMMERCE**National Oceanic and Atmospheric
Administration****50 CFR Part 227****RIN 0648-AD07****[Docket No. 90778-0061]****Endangered and Threatened Species;
Winter-run Chinook Salmon****AGENCY:** National Marine Fisheries
Service, NOAA, Commerce.**ACTION:** Proposed rule.

SUMMARY: The National Marine Fisheries Service (NMFS) is proposing to list the winter-run chinook salmon in the Sacramento River, California as a threatened species under the Endangered Species Act (ESA) of 1972. An emergency rule (published August 4, 1989) listing the species as threatened will expire April 2, 1990. Prohibitions and exceptions are included in the proposed rule. Critical habitat will be designated in a separate action.**DATES:** Comments on the proposed rule must be received by May 21, 1990. Requests for public hearings must be received by May 4, 1990.**ADDRESSES:** Comments should be sent to E. Charles Fullerton, Regional Director, National Marine Fisheries Service, Southwest Region, 300 S. Ferry Street, Terminal Island, CA, 90731.**FOR FURTHER INFORMATION CONTACT:** James H. Lecky, NMFS, Southwest Region, Protected Species Management Branch, 300 S. Ferry Street, Los Angeles, CA 90731, (213) 514-6664 or FTS 795-6664 or Margaret Lorenz, NMFS, Office of Protected Resources, 1335 East-West Highway, Silver Spring, MD 10910, (301) 427-2322.**SUPPLEMENTARY INFORMATION:****Background**

Winter-run chinook salmon are a unique population of chinook salmon in the Sacramento River and are distinguishable from the other runs in the River based on timing of their upstream migration and spawning season. For the most part, the winter run population comprises three year classes each of which return to spawn as 3-year-old fish. The best measure of trends in

abundance of winter-run is a series of counts of run size conducted by the California Department of Fish and Game (CDFG) at Red Bluff Diversion Dam.

The CDFG began conducting these counts in 1966, the year that the Dam was placed into operation. These counts show a persistent decline in run size from a 3-year average of about 84,000 fish for the years 1967 through 1969 to a 3-year average of about 2,000 fish for the years 1982 through 1984 (see Table 1).

On November 7, 1985, NMFS received a petition from the American Fisheries Society (AFS) to list the winter-run of chinook salmon in the Sacramento River as a threatened species under the Endangered Species Act of 1973 (ESA). NMFS reviewed the petition and determined that it contained substantial information indicating that the petitioned action might be warranted. On February 13, 1986, NMFS announced (51 FR 5391) its intention to conduct a review of the status of the run to determine whether or not listing the run was appropriate.

The status review was based on a consideration of available information on the run relative to the five criteria specified in section 4(a)(1) of the ESA and a consideration of the conservation efforts of the State of California and Federal resource management agencies to restore the run, as required by section 4(b)(1)(A) of the ESA. Information was provided by the petitioner, the State, Federal agencies that affect the run or its habitat, and the public. The results of the status review, along with the Notice of Determination, were published on February 27, 1987 (52 FR 6041).

In the Notice of Determination, NMFS concluded that the Sacramento River winter-run chinook was a species in the context of the ESA and recognized that the run had declined by more than 97 percent over a period of less than two decades. The definable causal agents in this decline were the construction and operation of the Red Bluff Dam, adverse temperature conditions created by the operation of Shasta Dam (particularly in dry years), and other human activities that had collectively degraded spawning and rearing habitat in the Sacramento River to the point that productivity of the run declined.

Based on its assessment that restoration and conservation efforts being implemented or planned by State and Federal resource management agencies adequately provided for the rebuilding of the population, NMFS decided not to list winter-run chinook in the Sacramento River as a threatened species under the ESA. After this determination, these restoration actions were incorporated in a Ten-point

Winter-run Restoration Plan and implemented by means of a Cooperative Agreement signed on May 20, 1988, by the CDFG, the Bureau of Reclamation (BR), the Fish and Wildlife Service (FWS), and NMFS. The Restoration Plan is reviewed in NMFS' original decision not to list the run (52 FR 6041) and again after a reconsideration of that decision (53 FR 49722). Among the ten points, the tasks expected to be of most immediate benefit to winter-run are raising the gates at Red Bluff Dam from December 1 through April 1 to allow free passage of adult winter-run to suitable spawning habitat and maintaining water temperatures at levels below lethal limits in the reach of river above the Dam that is used for spawning. Other points in the plan that are expected to benefit the run in the near future are a propagation program at the FWS' Coleman Hatchery and several studies to quantify and identify mitigation options for other activities affecting the run.

In the spring of 1988, prevailing weather patterns indicated that the drought conditions that had developed in the spring and summer of 1987 would persist through 1988. These conditions caused concern among the resource agencies that the conservation measures in place to enhance the run might not be adequate to address the adverse effect of anticipated drought conditions. Specifically, water forecasts indicated that river temperatures might reach levels lethal to developing winter-run eggs. NMFS decided to review its decision not to list the run and to evaluate the adequacy of the Ten-point Winter-run Restoration Plan for protecting the run during drought conditions.

On June 2, 1988, NMFS announced its intent to reconsider its decision to not list the run and opened a public comment period to ensure that all information on the status of the run and factors affecting it was available for the reconsideration (53 FR 20155).

Based on the information considered during the review, NMFS found that the status of the winter-run population had not deteriorated since its original determination not to list the run as threatened; none of the comments received during the reconsideration provided substantial new information indicating listing was necessary; the Ten Point Winter-run Restoration Plan was being implemented; and unprecedented actions were being carried out to minimize the adverse effects of the drought.

On December 9, 1988, NMFS reaffirmed its determination that the actions of State and Federal agencies to

restore the winter-run chinook salmon population and its habitat adequately addressed the threats to the population and that the population was not likely to become in danger of extinction throughout all or a significant portion of its range in the foreseeable future. Therefore, listing was not considered appropriate at that time (53 FR 49722).

Simultaneous with NMFS' review of the status of the winter-run population, the CDFG was conducting an independent review pursuant to a petition for listing the run under the State's Endangered Species Act. The CDFG concluded its review in February 1989, and recommended to the California Fish and Game Commission that the run not be listed because the restoration actions underway or planned for the future had a high probability of restoring the run (CDFG undated status review). Precipitation and runoff were again below normal for the water-year beginning October 1988. In February 1989, the BR announced cuts of up to 50 percent in water supply for central valley project water contractors because of the persistence of dry conditions. Heavy precipitation in March 1989, in the northern Sacramento River drainage basin restored Lake Shasta storage equal to the storage in October 1987. As a result of the heavy March rains, the BR was able to increase water supplies to contractors and maintain sufficient storage to manage water temperatures in the river. The BR was also able to leave the gates at Red Bluff Diversion Dam out of the water two weeks beyond the April 1 deadline agreed to in the Cooperative Agreement. This provided an additional two weeks of unrestricted access for returning winter-run to suitable spawning habitat, but lower than expected returns of winter-run were in the river to benefit from this additional period of unrestricted passage.

For undetermined reasons, the 1989 run returned at much lower levels than expected. The CDFG estimated run size for 1989 was about 550 fish, roughly 75 percent below the expected run size. Since 1982, the run has varied at about a mean run size of 2,382 fish, and resource agencies had expected the 1989 run to be near that level.

Based on the poor return of fish in 1989 and because the U.S. Fish and Wildlife Service's hatchery program (a task in the Ten-point Winter-run Restoration Plan) for augmenting natural production was still developmental and not likely to produce substantial numbers of juvenile fish for several years, the CDFG reversed its position and recommended at the May 1989

meeting of the California Fish and Game Commission that the Commission list the winter run as a threatened species under the California Endangered Species Act. The Commission considered the CDFG staff's recommendation, but voted to list the run as endangered under state law. The run was listed as endangered under State law in August 1989.

NMFS also believed that the 1989 run size was dangerously low. NMFS has estimated that a run size of between 400 and 1,000 fish is necessary to maintain genetic diversity in the winter-run population (52 FR 6041). If such poor returns occur for the remaining two year classes in the population, NMFS believes the population will begin losing genetic diversity through genetic drift and inbreeding. Further, a small population is vulnerable to major losses from random environmental events such as droughts and El Nino events. NMFS expects that the 1987 and 1988 year classes, which are currently in the ocean, benefited from the Ten-point Winter-run Restoration Plan and believes that the winter-run is not currently in danger of extinction. Nevertheless, the run is likely to become endangered in the foreseeable future if action is not taken to ensure that conditions are maintained in the river for maximum production from the fish that successfully spawn. Therefore, NMFS is proposing to list winter-run chinook salmon in the Sacramento River as a threatened species under the ESA.

TABLE 1.—ANNUAL ESTIMATED RUN SIZE AT RED BLUFF DIVERSION DAM

Year	Number of fish
1967.....	57,306
1968.....	84,414
1969.....	117,808
1970.....	40,409
1971.....	53,089
1972.....	37,133
1973.....	24,079
1974.....	21,897
1975.....	23,430
1976.....	35,096
1977.....	17,214
1978.....	24,862
1979.....	2,364
1980.....	1,156
1981.....	20,041
1982.....	1,242
1983.....	1,831
1984.....	2,663
1985.....	3,962
1986.....	2,422
1987.....	2,236
1988.....	2,085
1989.....	550

Summary of Factors Affecting the Species

Section 4(a)(1) of the ESA specifies five criteria to be evaluated in reviewing the status of a species or population proposed for listing. These criteria were reviewed in the first Notice of Determination published February 27, 1987 (52 FR 6041), and again in the subsequent Notice of Determination published December 9, 1988 (53 FR 49722). The criteria for evaluating the status of the run are reviewed again to present a complete document that contains current information.

1. The present or threatened destruction, modification, or curtailment of its habitat or range.

Modification and loss of spawning and rearing habitat probably have been major factors contributing to the decline of the winter run. Essential elements of suitable spawning habitat are the availability of clean gravel which provides a substrate for redd (nest) construction, adequate flow of oxygenated water through the gravel to aerate the eggs, and water temperatures between 42.5 and 57.5 °F which are optimal for egg development (Combs and Burrows 1957). Although, studies reviewed in a literature survey conducted by the California Department of Water Resources indicate that the optimum range of temperatures for development through the emerged fry stage may be bound by 55 °F on the upper end (Seymour 1956 cited in Boles 1988). Historically, winter-run chinook found and used this type of habitat in the cold spring-fed headwaters of the tributaries to the Sacramento River. For example, they were reported to have spawned in the McCloud River before access to that river was blocked by the construction of Shasta Dam (Slater 1963).

Shasta and Keswick Dams

In the 1940s, the BR initiated its Central Valley Project with the construction of Shasta and Keswick Dams on the Sacramento River. These dams blocked access to the winter-run's spawning habitat, but simultaneously created new habitat by releasing cold hypolimnetic waters into the main stem of the Sacramento River. During the late spring and summer when the winter-run chinook are spawning, the cold water released from Shasta and Keswick Dams provides adequate spawning habitat downstream to about Red Bluff in most normal water years. During dry years, when releases from Shasta are not as cold and river water warms more quickly, suitable spawning conditions exist only in a restricted area

downstream from Keswick Dam. The design of the Shasta Dam spill gates and intake to the powerhouse penstocks contributes to this problem. As the Shasta Lake is depleted, in dry years, the thermocline falls below the intake to the powerhouse, and no mechanism exists for releasing cold deep water unless hydropower is not generated. When power is generated, warm surface water is withdrawn for power generation and released into the river where it adversely affects spawning habitat.

In March 1988, the Central Valley Regional Water Quality Control Board issued Order No. 88-043, imposing waste discharge requirements (including temperature) on the BR's Shasta-Trinity River Division operation. The Order prescribes maintenance of Sacramento River temperatures of not more than 56 °F between Keswick Dam and Hamilton City (approximately 30 miles downstream from Red Bluff) to protect fishery resources. This is the first time that specific, enforceable temperature standards have been imposed. The Order cited evidence that future BR Central Valley Project operations would cause water temperatures of Shasta Dam discharges to increase and " * * typically exceed 56° F" during the period of winter-run spawning and rearing. The BR opposed the order and is currently appealing the decision on jurisdictional grounds. They are urging, instead, the use of non-binding, voluntary agreements (such as the May 20, 1988 cooperative agreement) to achieve similar ends such as they have done each year since 1987. On December 8, 1989, the Regional Board rescinded the order, and on January 8, 1990, the State Water Resources Control Board announced its intent to address the issue using its water right authority.

In May 1987, the fishery agencies expressed to BR their concern over predicted lethal temperatures below Keswick and estimates of substantial mortality of the 1987 winter-run year class. The BR responded with a water management strategy to lower river temperatures that included opening, for the first time since the Dam was constructed, a low-level outlet in Shasta Dam that draws deep, cold water. This low-level release contributed to maintaining an average river temperature of 57.5 °F from August 27, 1987 to September 10, 1987. An assessment of the benefits of this and other actions taken to protect the 1987 winter run must wait until 1990 when the progeny of the 1987 run return from sea to spawn.

With the drought conditions persisting into 1988, the BR again agreed to open the low level release, at the expense of power generation, to maintain suitable river temperatures. Even employing these extraordinary measures, the BR was only able to maintain suitable spawning and incubation conditions downstream to Cottonwood Creek, about 20 river miles upstream from Red Bluff. The BR also made low level releases in 1989 to protect winter-run spawning habitat.

The BR is committed to constructing a permanent temperature control device at Shasta Dam that will allow water to be drawn into the power penstocks from varying levels in the lake. This will allow better control of river temperatures without foregoing the opportunity to generate power from the water released through the dam.

Spawning habitat has also been degraded by decreases in the rate of replenishment of gravel suitable for spawning. Construction of Shasta and Keswick Dams precluded the recruitment of new gravel from the river and its tributaries above those dams, and gravel mining in the tributaries streams below those dams has slowed the recruitment of new gravel into the Sacramento (CDWR 1980). Consequently, the amount of suitable spawning habitat has been shrinking. In 1985, the CDFG began a spawning gravel replenishment program. The CDFG and the BR are purchasing gravel and the CDFG is placing it in the river to restore degraded spawning riffles in areas of the river used by the winter run. In addition to replenishing spawning riffles, the CDFG is working with the California Department of Water Resources to modify gravel mining permits to ensure gravel of an appropriate size for salmon spawning habitat is left in the river bed for natural distribution to the main stem or that it be made available for transport to areas where it may be used to restore degraded spawning habitat.

Red Bluff Diversion Dam (RBDD)

An equally important problem has been the impediment that the RBDD presents to upstream migrant salmon. The RBDD was built to provide a head of water for diversion to farm lands and wildlife refuges in the northern portion of California's Central Valley. It began operating in August 1966. The dam was designed with fish ladders to allow passage to upstream migrants, but these are not adequate particularly during high flows that occur in the winter when winter-run are migrating upstream. Hallock et al. (1982) and Vogel et al. (1988) investigated the effect of the dam

on upstream migrants and found that nearly 40 percent of tagged upstream migrants were blocked by the RBDD. Fish that are blocked spawn downstream from RBDD where river temperatures commonly exceed 57.5 °F causing almost a total mortality of incubating eggs. In addition, the physiological stress associated with delays and repeated attempts to get past the dam may contribute to reduced fecundity of fish that do get past the dam and spawn in suitable habitat.

At the recommendation of the fishery resource agencies, the BR agreed to an experimental period during which the gates at RBDD would be raised (opened) between December 1 and April 1 with the understanding that the gates may have to be lowered (closed) to deliver water for irrigation or maintenance of canals. The period of migration of the four chinook runs past RBDD has been characterized by averaging the cumulative number of fish that passed RBDD during the years 1971 through 1982. Based on these data, raising the gates through April 1 should allow about 66 percent of the winter run free access to its spawning habitat.

From December 1 to April 1, 1986-87, the gates were raised for a period of 94 days. The FWS conducted a study of fish passage during the period the gates were opened. The results of that study showed that 11 radio tagged salmon were delayed an average of 3.19 hours or 28 times less than when the gates were down. Also, none of the tagged salmon that approached the dam, while the gates were raised, backed downstream away from the dam (FWS 1987). During the 1986-87 winter, about 95 percent spawned above RBDD, indicating that raising the gates was relatively effective in improving passage of the winter-run.

The BR has continued this operational procedure in subsequent winters. During the winter of 1987-88, the gates were raised for 68 consecutive days before being lowered to provide irrigation water to the Tehama-Colusa Canal users. Eighty four percent of the run spawned above RBDD in 1988. During the winters of 1988-89, the BR was able to keep the gates up a longer period, and CDFG estimated that 97.8 percent of the run spawned upstream from RBDD.

The FWS has recommended that the BR construct new state-of-the-art fish passage facilities at RBDD that would resolve fish passage problems, and would continue to allow the dam to operate during the winter. The BR is evaluating alternatives for new fish passage facilities, and has agreed to continue the practice of raising the gates

during the winter until new passage facilities are in place.

The RBDD and its associated diversion facilities also have had an adverse effect on migrating winter-run salmon downstream from the dam. The Tehama-Colusa Canal (TCC), which diverts Sacramento River water at RBDD, does not have an efficient fish screening facility. As a result, outmigrating juvenile salmon and fry have been entrained and lost. Although the effect of this mortality on the winter-run population has not been specifically quantified, studies by the FWS (Vogel et al. 1988) indicate that an estimated 3.9 percent of the outmigrating juvenile winter run are lost at these screens. As part of the BR's efforts to improve operation of the RBDD and the TCC, and to mitigate impacts to fish populations, the BR is constructing a new fish screen and bypass system at the TCC. The design and placement of the new fish screens was developed in consultation with NMFS, FWS, and the CDFG. These screens are a state-of-the-art design and should minimize the effect of entrainment on winter run. The construction schedule is designed to "phase in" the new screens so that there will be fish protection at all times. Work on the new screens begin in August 1988 and will be complete in fall 1990. Validation studies will be conducted to ensure the screens are as efficient as planned.

Additional Water Marketing

The BR has expressed its intent to market an additional 1.1 million acre-feet of water from the Central Valley Project (CVP). All of the fishery agencies have warned the BR that there is no water available from the Trinity River side of the system because it is committed for fishery flows under a 1980 decision by Secretary of the Interior. Further, because the State of California is currently undergoing a three-year review and modification of water rights (known as the Bay-Delta Water Rights Hearings) in the Sacramento/San Joaquin-Trinity River systems, NMFS believes that the marketing effort is premature. Although the BR is still preparing an Environmental Impact Statement on their marketing plan, the BR has stated that they could not go forward until the State Water Resources Control Board had rendered its final water rights finding. If the additional water is marketed, it will likely exacerbate the problem of maintaining suitable temperatures throughout the spawning habitat now judged to be suitable for winter-run.

Anderson Cottonwood Irrigation District Diversion Dam

The Anderson-Cottonwood Irrigation District (ACID) Diversion Dam is an antiquated structure built in 1917. The gates consist of a series of flash boards that are put in place and manipulated manually. Generally, the dam is operational from mid-March to mid-April, thus the flash boards are not in place during the early part of the winter-run's upstream migration and about 40 percent of the run should pass the dam prior to March 15. There is a fish ladder at the dam, but it is inadequate to facilitate passage of all the salmon that encounter the dam. This excludes some fish from existing spawning habitat above the dam (USBR 1983). Blockage at this dam is not as severe a problem as blockage at the RBDD because suitable spawning habitat exists below it. Consequently, the problem has not been fully investigated, and the effect of the blockage on the population remains unquantified.

The seasonal operation of the ACID dam creates a second problem. When salmon migrate past the dam before it is put into operation and spawn immediately upstream, the small reservoir created by the dam when is put into operation covers the salmon redds (spawning grounds). This reduces the flow of aerated water over the edge and may reduce their survival. The effect of this problem on winter run also has not been quantified.

A third problem is created by the operational and structural limitations of the ACID dam. The flash boards can be manipulated in flows of 6,000 cubic feet per second (cfs) or less, and they can withstand flows of no more than 12,000 cfs. Because of these limitations, the operations of ACID and Keswick dams are coordinated through an informal agreement between the BR and the ACID. Any time the flash boards have to be manipulated, the BR reduces the flow in the river to 6,000 cfs by reducing the releases from Keswick. When releases from Keswick must exceed 12,000 cfs, the BR first reduces the flows to 6,000 cfs so the flash boards may be configured appropriately, and the flow is increased to the necessary level. These fluctuating flows adversely affect the run by dewatering redds that were constructed at high flows, reducing the flow of aerated water through the redds to inadequate levels, and stranding juvenile fish. Since the winter-run spawning season is encompassed by the irrigation season, it is likely that this problem has an adverse effect on the run.

In 1987, the BR and ACID modified their operations to minimize the need for in season adjustments to the ACID dam, thereby reducing the magnitude of this problem. In January 1989, the ACID, CDFG, NMFS, BR, and the CDWR met to discuss options for improving the dam. The preferred solution is to redesign and modernize the existing dam with adequate ladders and gates that would eliminate the flow problems, but other alternatives including relocation of the dam will be considered. In the interim, CDFG is pursuing temporary remedies such as a temporary ladder in the dam to improve passage.

Pollution

Pollution also has degraded the spawning habitat of the winter run. Runoff from inactive mining operations at Iron Mountain Mines in the vicinity of Spring Creek, a tributary to the upper Sacramento, leaches heavy metals which can reach levels that are lethal to juvenile fish, alevins, and eggs. A debris dam was constructed on Spring Creek in the 1940s to collect debris eroded from the mine sites and to control the release of toxic water into the mainstem of the Sacramento River. Under normal conditions, releases from Spring Creek Dam are diluted by releases from Keswick Dam so that concentrations of heavy metals in the Sacramento remain below toxic levels. However, during years of heavy precipitation, spills from Spring Creek Reservoir result in uncontrolled releases of toxic water. Generally, this occurs in the winter when fall-run chinook alevins are hatching and fry are emerging from the gravel. These are the life stages most sensitive to pollution, and large kills of these life stages have been attributed to spills of toxic water. Winter-run adults are subjected to these spills, and, while kills of adult fish have not been reported, sublethal effects such as reduced fecundity are probable.

The Environmental Protection Agency (EPA) has placed the site on its Superfund Priority List, and they have completed a Remedial Investigation/Feasibility Study of the problem. EPA has identified a combination of source control, treatment, and water management as the most cost effective remedial solution. EPA and BR have drafted an Agreement to implement actions to resolve the Spring Creek toxicity. Under this Agreement, EPA will fund activities through its Superfund Program. The EPA will be the managing agency. The BR will be responsible for design and construction of the water management components that protect most of the Spring Creek Basin drainage from being contaminated and will

reduce the possibility of a spill from Spring Creek Reservoir. Implementation of this Plan is estimated to cost about \$70 million. Only a few feasibility investigations of source control methods have been conducted although several of the water management solutions are in the planning phase.

Hydroelectric Projects

The Federal Energy Regulatory Commission (FERC) is considering licensing applications for two hydroelectric projects which, if authorized, would adversely affect the winter run. These are the Lake Redding Project and the Lake Red Bluff Project which was recently reactivated by the FERC. If built, these projects would result in loss of winter-run habitat and aggravated fish passage problems. Section 18 of the Federal Power Act (16 U.S.C. 791 *et seq.*) grants NMFS authority to prescribe standards for fish passage. These standards must be met before the projects can be authorized. These provisions combined with FERC's responsibilities under Section 7 of the ESA will ensure that no new threats to the winter-run population will be allowed to develop as a result of hydroelectric projects on the upper Sacramento River.

Bank Stabilization

Much of the Sacramento has been ripped, leveed, or otherwise channeled to prevent erosion of agricultural lands and contain flood waters. Studies of bank protection projects in the upper Sacramento River have demonstrated that juvenile salmon show a marked preference for areas that have not been stabilized (Schaffter et al. 1983, Michny and Hampton 1984). Therefore, bank stabilization may affect the quality of rearing habitat. The COE and the FWS are cooperating in the investigation of methods to restore riparian habitat on stabilized banks so that the quality of the habitat for rearing fish can be maintained.

2. Overutilization for Commercial, Recreational, Scientific or Educational Purposes.

Winter-run chinook are probably subjected to a harvest rate that is less than that for the other three races of chinook in the Sacramento River. This belief is based on two observations. First, the separation in timing of the adult spawning migration from the ocean between the winter run and the fall run (the target run for the ocean fishery) is almost complete. Consequently, winter-run fish are not available to the ocean fishery for as long as the fall run. This should contribute to

a lower harvest rate. Second, winter-run chinook return to the Sacramento River at a younger age and at a smaller size than the other three runs. According to Hallock and Fisher (1985), winter-run chinook mature almost exclusively as two and three year old fish. Age composition of a typical run is 25 percent 2-year-olds, 67 percent 3-year-olds, and 8 percent 4-year-olds; whereas fall-run chinook tend to mature somewhat later. Since fall run return at an older age, they are generally larger. This indicates that the winter-run chinook are available to the ocean sport and commercial fisheries for a shorter period of time than the other runs, and receive greater protection from the size limits imposed by the Pacific Fishery Management Council (PFMC).

Ocean fishing regulations limit chinook caught by sport fishermen to 20 inches or greater, and 26 inches or greater for commercially caught chinook. Since winter-run chinook return at a smaller size, they are more available to the sport fishery than the commercial fishery. This explains why the ocean sport fishery catches 71 percent of the ocean harvest of winter-run chinook and the catch consists of mostly 2-year old fish. The commercial fishery is responsible for about 29 percent of the ocean catch of winter-run chinook and their catch consists mostly of 3-year old fish.

Hallock and Fisher (1985) report the percentage of chinook that were scarred by hooks and released by the ocean fishery. Hook scars occur when fish under legal size limits are released alive. Of the fish examined at the trapping facility at the RBDD, the spring, fall, and late-fall runs experienced 38 percent greater hook-scarring than the winter run. Hook-scarring cannot easily be used to infer harvest rates or even "shaker mortality" (associated with the release of under-sized fish), but it does show a reduced interaction between the winter run and the ocean fisheries.

Nearly all data about the time, growth, distribution, and mortality of salmon in the ocean come from tagging experiments at hatcheries using coded wire tags (cwt). Since winter run chinook spawn naturally, they have not been included in studies using coded wire tags. However, Hallock and Fisher (1985) report a marking study, conducted in 1969-71, in which juveniles from three brood stocks were seined from the Sacramento River, fin clipped, and released. Recoveries of the adults from these releases were tabulated and estimates made of age at harvest and harvest rate. Their results confirmed that winter-run chinook mature almost

exclusively as two and three year olds and produce an estimated catch to escapement ratio of 0.53:1.0 and an ocean harvest rate of 34.6 percent.

These are likely conservative estimates because a duplicate mark was used unintentionally in other California and Oregon chinook studies during the same period. Consequently, the mark returns in the ocean fishery that were attributed to the Sacramento River winter run were too high by some unknown amount. Also the harvest rate for winter-run has likely declined since the study was completed, because ocean fishing regulations are currently more restrictive than they were during the early 1970s. The effect of each of these factors is an over estimation of the ocean harvest of winter run.

Data on inland sport harvest of adult winter-run chinook are scarce: estimates are available from 1968-1973 and 1975. Hallock and Fisher (1985) report data for these years that show Sacramento River sport harvest rates for winter-run chinook averaging 8.5% of the in-river harvest.

Hallock and Fisher (1985) reported that 85% of the total catch of winter-run chinook from the 1969-71 broods were caught in the ocean and 15% were caught in the river. Based on the data discussed above, they estimated the total catch to escapement ratio was 0.58:1.0 and a total harvest rate of 38%.

The harvest rate of winter-run chinook is substantially below that managed for any other chinook stock on the Pacific coast. The PFMC reports an index of ocean fishery harvest rates south of Point Arena for California Central Valley chinook. The 16-year average for the index is 64%. The CDFG (L.B. Boydston, CDFG, personal communication) estimates that the total harvest rate for these stocks (including areas north of Point Arena) is about 30% greater than that reported in the index or about 82%. This represents a catch to escapement ratio greater than 4:1. In Washington State where, in addition to conservation management, the ocean fishery is restricted to achieve court-ordered allocations of chinook to inside Indian fisheries, the ocean catch to escapement ratio are managed between 2:1 and 1:1 (J. Coon, PFMC staff, Personal communication).

NMFS believes that any stock (even a marginally healthy one) should be able to maintain stable population levels and even growth at the moderate harvest levels to which winter-run chinook have been subjected and that harvests have not been instrumental in the decline of winter-run chinook in the Sacramento River. Nevertheless, in 1987 the CDFG

implemented seasonal closures in the upper Sacramento and a quota of 175 fish and began monitoring the catch. The estimated take was 26 fish in 1987 and 91 in 1988. After the poor return of winter run in 1989, the CDFG has implemented even more restrictive sport fishing measures in the river and the ocean adjacent to the Golden Gate. NMFS agrees that these measures are prudent and necessary to maximize the probability that the adults that survive and return to the spawning grounds have the opportunity to spawn.

3. Disease or Predation.

The magnitude and extent of predation throughout the Sacramento River has not been determined. However, observations indicate substantial predation may occur at certain locations. For example, losses of fall-run salmon to predation can be significant at RBDD (Vogel et al. 1988 and Hall 1977 cited in Garcia 1989). In addition, there is a potential for high levels of predation at the Glenn-Colusa Irrigation District diversion facility near Hamilton City. Squawfish and striped bass have been observed preying on salmonids salvaged from Sacramento-San Joaquin Delta diversions. Garcia (1989) reviewed the impacts of squawfish predation on juvenile chinook salmon at RBDD and other locations in the Sacramento River. Although the potential for a substantial loss of winter-run juveniles exists at RBDD, Garcia concluded that because information on the timing of the winter-run downstream migration and the biology of the squawfish were lacking, impacts could not be quantified.

NMFS has funded an experimental fishery for squawfish in the vicinity of RBDD. Although squawfish may be catchable in commercial quantities and development of the fishery would likely reduce impacts of predation, recent analysis of squawfish flesh has shown dioxin contamination from paper mills on tributary streams. Consequently, squawfish may not be sold for human consumption.

4. The Inadequacy of Existing Regulatory Mechanisms.

Relevant laws that comprise the existing regulatory mechanisms were listed in the Notice of Determination (52 FR 6041) and described as providing adequate mechanisms for restoring the winter run in the Sacramento River. However, the decline in the size of the run since the late 1960s indicates that these regulatory mechanisms were not applied effectively with respect to the winter run. NMFS now believes the ESA is needed to augment and enhance the

effectiveness of the existing regulatory mechanisms.

5. Other Natural or Manmade Factors Affecting the Continued Existence of the Species.

In addition to the RBDD and TC² (discussed under criterion 1), there are large diversions of water at the Glenn-Colusa Irrigation District's diversion facility and at the Sacramento-San Joaquin Delta pumping plants that likely entrain juvenile salmon as well. There are also numerous small unscreened diversions on the Sacramento River. The impact of these diversions needs to be quantified, and remedial measures pursued and implemented. The various provisions of sections 7, 9, and 10 of the ESA can be brought to bear on this problem.

Natural factors of greatest concern are periodic droughts and the oceanographic phenomenon known as El Niño. The 1976-77 drought severely reduced the size of two consecutive cohorts leaving the 1978 brood as the only large spawning cohort (Table 1). The strong El Niño event during 1982-83 contributed to the decline of the last strong cohort. The only measure to mitigate the profound impact of a strong El Niño is hatchery rearing to increase smolt production from the returning spawners that survive the poor ocean conditions.

Drought conditions, such as those that existed during the past two dry years in Northern California, most directly threaten the winter run by causing elevated water temperatures on the spawning grounds. This problem was resolved using interim measures in 1987, 1988, and 1989. However, a permanent temperature control facility at Shasta Dam is needed to solve this problem for the long term.

Conclusion

In its Notice of Determination (52 FR 6041), NMFS estimated that a run size of between 400 and 1,000 fish was necessary to maintain genetic diversity in the winter-run population. The 1989 run was within that range. If such poor returns occur in the remaining two year classes in the population, NMFS believes the population will begin losing genetic diversity through genetic drift and inbreeding. Further, a small population is vulnerable to major losses from random environmental events such as droughts and El Niño events. Based on the size of the 1989 run and the continuing threats to the population, NMFS believes that the winter run of chinook salmon in the Sacramento River is likely to become an endangered species in the foreseeable future. Therefore, NMFS concludes that the run should be listed as threatened under the

ESA and that the various agencies affecting the run and its habitat should continue to ensure that conditions are maintained in the river for maximum production from the fish that return to spawn annually.

Available Conservation Measures

Conservation measures provided to species that are listed as threatened under the ESA include recognition, recovery actions, implementation of certain protective measures, and designation and protection of critical habitat. Some of the most useful protective measures are contained in section 7 of the ESA. Pursuant to section 7, all Federal agencies are required to conduct conservation programs for threatened and endangered species and to consult with NMFS regarding the potential effects of their actions on species under NMFS' jurisdiction.

NMFS has initiated section 7 consultations, pursuant to the emergency listing on August 4, 1989, with the Federal agencies whose actions affect the continued existence of the winter-run. NMFS is currently consulting or planning to consult with the BR on various aspects of the Central Valley Project, the Army Corps of Engineers on gravel mining operations and flood control projects, and the Pacific Fishery Management Council on the effect of sport and commercial fishing.

NMFS will also continue its coordination with the State of California in managing this run and its habitat. The State's Endangered Species Act contains a provision for interagency consultation among State agencies similar to section 7 of the Federal ESA. The CDFG will be reviewing impacts of State actions on the winter run to see if there are actions beyond the Ten-point Restoration Plan that can be taken. Among other actions, they will be reviewing the State's water project for opportunities for improved water conservation, and they will be reviewing their own sport and commercial fishing regulations to ensure those fisheries will not jeopardize the continued existence of the winter run.

NMFS will also participate in the State's review of sport and commercial fishing regulations. NMFS is charged with implementing the Magnuson Fishery Conservation and Management Act (MFCMA) and publishes and administers regulations to implement fishery management plans developed by Regional Fishery Management Councils. Generally, interjurisdictional fisheries or fisheries that occur primarily in Federal waters are candidates for management under the MFCMA. The Pacific salmon fisheries are such fisheries. The Pacific Fishery Management Council manages

salmon fisheries off the coasts of Washington, Oregon, and California. Generally, the Council strives to manage the fishery by consensus among the Federal and State fishery management agencies so that State regulations in State waters are consistent with Federal regulations in Federal waters.

NMFS expects that through these consultations under the respective State and Federal laws, a State/Federal regulatory regime will be developed that will ensure the winter run population is not adversely affected by sport or commercial fishing. Therefore, NMFS is providing an exemption from the prohibition on taking of winter-run chinook for fishermen who are fishing lawfully under State law or regulation or Federal regulations under the MFCMA. However, NMFS retains its right and responsibility to override State fishing laws and regulations if the State develops regulations that are less protective than NMFS believes is necessary for a species listed as threatened under the Federal ESA.

NMFS has appointed a Recovery Team to develop a recovery plan for winter-run chinook salmon in the Sacramento River. The first meeting of the team was on November 28, 1989. The team is reviewing the Restoration Plan as a basis for generating a more comprehensive recovery plan.

Critical Habitat

Section 4(a)(3)(A) of the ESA requires that, to the extent that it is prudent and determinable, to designate critical habitat concurrently with the listing of a species. However, unlike designating a species as threatened or endangered, economic impacts must be considered when designating critical habitat. An area may be excluded from the designation if it is determined that the benefits of an exclusion outweigh the benefits of including the area as critical habitat, and the exclusion will not result in the extinction of the species.

In the emergency rule, NMFS designated the portion of the Sacramento River between Red Bluff Diversion Dam, Tehama County (River Mile 243) and Keswick Dam, Shasta County (River Mile 302) including the adjacent riparian zones, the water in the river, and the river bottom as critical habitat for the winter run of chinook salmon in the emergency rule. The economic impact analysis was cursory because the designation was to last only 240 days, and a more rigorous analysis is needed to ensure compliance with the requirement of section 4(b)(2). Since this analysis has not been completed, we are not able to determine the extent of

critical habitat, and the designation will be delayed until the analysis is completed. In this analysis, NMFS will evaluate other alternatives for critical habitat designation including habitat in which winter run have spawned successfully during exceptionally good water years.

NMFS believes that deferring the designation of critical habitat should not be detrimental to the conservation of the run because section 7 consultations conducted by NMFS under the ESA will identify any Federal (including Federally permitted or funded) actions that harm the species including modifying or destroying its habitat. The prohibitions on taking the species will continue to be in effect, and any action that is likely to adversely modify or destroy habitat will be considered a take and will be addressed by NMFS.

Classification

The 1982 Amendments to the ESA (Pub. L. 97-304), in section 4(b)(1)(A), restrict the information which may be considered when assessing species for listing. Based on this limitation of criteria for a listing decision and the opinion in *Pacific Legal Foundation v. Andrus*, 675 F. 2d 829 (6th cir., 1981), NMFS has categorically excluded all endangered species listing from environmental assessment requirements of the National Environmental Policy Act (48 FR 4413-23, February 6, 1984).

As noted in the Conference report on the 1982 amendments to the ESA, economic considerations have no relevance to determinations regarding the status of species. Therefore, the economic analysis requirements of Executive Order 12291, the Regulatory Flexibility Act, and the Paperwork Reduction Act are not applicable to the listing process.

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List of Subjects in 50 CFR Part 227

Threatened fish and wildlife.

Dated: March 12, 1990.

James E. Douglas, Jr.

Assistant Administrator for Fisheries.

For the reasons listed in the preamble, part 227 of title 50 of the Code of Federal

Regulations is proposed to be amended as follows:

PART 227—THREATENED FISH AND WILDLIFE

1. The authority citation for part 227 continues to read as follows:

Authority: 16 U.S.C. 1531 et seq.

2. Under subpart A, section 227.4, paragraph (e) is revised to read as follows:

§ 227.4 Enumeration of threatened species.

* * * * *

(e) Sacramento River winter-run chinook salmon (*Oncorhynchus tshawytscha*).

3. The heading of subpart C is revised to read as follows:

Subpart C—Threatened Marine and Anadromous Fish

4. Section 227.21 under subpart C is revised to read as follows:

§ 227.21 Sacramento River winter-run chinook salmon.

(a) *Prohibitions.* The prohibitions of Section 9 of the Act (16 U.S.C. 1538) relating to endangered species apply to the Sacramento River winter-run chinook salmon except as provided in paragraph (b) of this section.

(b) *Exceptions.* (1) The Assistant Administrator may issue permits authorizing activities which would otherwise be prohibited under paragraph (a) of this section in accordance with and subject to the provisions of part 222—subpart C—Endangered Fish and Wildlife Permits.

(2) Excepted from the prohibitions are any acts involving winter-run chinook salmon which were taken lawfully under a State of California fishing law or regulation, or which were taken lawfully under a fishing regulation under the Magnuson Fisheries Conservation and Management Act. There will be a rebuttable presumption that the winter-run chinook involved in any acts are not entitled to the exemption contained in this subsection.

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